

Barnacles of the Northeastern Gulf of Mexico

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IN the course of research on fouling organisms in the northeastern Gulf of Mexico, several species of barnacles (Cirripedia) have been collected which had not been reported previously from these waters. As records have accumulated since the study began in 1961, the gaps in our knowledge of this important group have become more impressive and more inviting to the attention of the student of marine biology. Because barnacles grow in great abundance on most structures and require control measures costing many millions of dollars annually, they are usually regarded as the most important component of the fouling community. They are well represented in the northeastern Gulf of Mexico, both in quantity and in numbers of species.

In this report are listed the species of barnacles from inshore waters of the northeastern Gulf of Mexico with annotated remarks on their collection and distribution. These records are presented here to augment our knowledge of the barnacle fauna, and to alert students and investigators in marine biology to their presence. A large number exhibit relatively close associations with specific substrates, particularly with other marine animals, and provide interesting subjects for research on their symbiotic existence and related adaptations of morphology, physiology, and life history. Although these barnacle species are often segregated among their respective preferred substrates or hosts in juvenile and adult stages, the larval stages (nauplius and cypris larvae) occur together with other plankton, and contribute to the great numbers of larval plankton in the sea. Consequently, a thorough analysis of the planktonic stages would depend on a recognition of the numerous species of barnacles present in our waters.

A number of new records are included which extend known geographic ranges from other areas and from the southern part of the Gulf of Mexico, and which contribute to our knowledge of the local fauna and to the zoogeography of the Gulf.

MATERIALS AND METHODS

Collections of barnacles were made principally in the vicinity of the Florida State University Marine Laboratory at Alligator Harbor, Franklin County; and in the vicinity of the dredged en-

trance to St. Andrews Bay, near Panama City, Bay County, Florida, approximately 90 miles west of the laboratory.

This part of the Gulf coast is dominated by sandy beaches and low marsh-lands, generally unsuited for attachment of barnacles. However, hard substrates available in this area include shell material, and such man-made structures as jetties, pilings, old boats, buoys, and bridge piers, as well as several hard bottom rock outcrops a short distance offshore. These structures present habitats suitable for a number of sessile marine invertebrates, including several common species of barnacles. The shells of certain invertebrates and the leathery skin of sea turtles present satisfactory attachment sites for a number of more selective species, several of which appear to be restricted to such symbiotic associations with other animals. Additional species are highly modified parasitic forms, penetrating into the tissues of certain species of crabs. Collections from these several habitats constitute the basis for this report. For identification, the specimens were examined under a stereoscopic microscope, and where necessary, their mouthparts and cirri were examined by means of a compound microscope.

Identifications were made primarily with the aid of Pilsbry's monographic treatment of the American species (Pilsbry, 1907, 1916), which is strongly recommended for illustrations and descriptions of most species recorded here. Previous records of barnacle distribution in the Gulf of Mexico have been tabulated and analyzed by Henry (1954, 1959), whose studies have served as valuable points of reference. More recent records have been reported from the Panama City area by Hulings (1961).

An unpublished mimeographed check-list (R. W. Menzel, editor) and a modest reference collection of marine animals of the immediate vicinity are provided by the Florida State University Marine Laboratory for the use of students and investigators. The check-list, containing nine barnacle species identified by Charles Yentsch, has provided a point of departure for this study.

In the following systematic treatment, collection data are provided for at least one occurrence of each species examined. No attempt was made to account for every collection of the more common species. Available records from the literature of barnacles from the northeastern Gulf are included in this account. Representative specimens will be deposited in the collections of the United States National Museum.

Order THORACICA

Suborder Balanomorpha

Family BALANIDAE: Subfamily BALANINAE

1. *Balanus amphitrite amphitrite* Darwin

From rock jetties at the entrance to St. Andrews Bay, near Panama City, Bay Co., 6 November 1964. This species has been recorded from St. Marks, Wakulla Co., and locations on the Florida West coast by Henry (1959) as *B. a. denticulata*.

2. *Balanus calidus* Pilsbry

From shells collected on hard bottom 3 miles SE of Dog Island (off Carrabelle, Fla.), at 20-30 feet, 29 September 1962; 29 October 1962; 23 November 1962; 16 May 1963; 19 June 1965; from other barnacles (*Chelonibia testudinaria*) attached to a loggerhead turtle (*Caretta caretta*) collected near Bald Point, 2 May 1965; and from shells of the calico scallop (*Aequipecten gibbus*) from off Cape St. George, 2 October 1962. Apparently this common species attaches to a variety of substrates in waters of high salinity (> 30 o/oo). It has been recorded from the Panama City area by Hulings (1961).

3. *Balanus declivus* Darwin

From loggerhead sponges (*Spheciospongia vesparia*) collected at 6 feet depth at St. Teresa, Franklin Co., 10 February 1962 and 16 May 1964. Several specimens were completely imbedded in the sponge tissue, with only the aperture remaining visible at the bottom of a shallow pit. The long, curved rostral plate typical of this species provides a large surface available for sponge attachment. This barnacle is characteristically imbedded in sponges. It possesses a special series of rasping spines on the fourth cirri which would assist in retarding overgrowth by tissues of the host sponge. This species has not been reported previously from this part of the Gulf, previous records being those of Pilsbry (1916) from off Cape Sable in southern Florida, and of Henry (1954) from Texas.

4. *Balanus eburneus* Gould

From rock jetties at the entrance to St. Andrews Bay, near Panama City, 6 November 1964; and from pilings at St. Teresa, 25 May 1964, by W. Stewart. This common species occurs on a wide variety of substrates, and is particularly abundant near the low tide line and in estuarine areas.

5. *Balanus galeatus* (Linné)

From gorgonians (*Leptogorgia virgulata*) collected at St. Teresa, 16 May 1964; at the entrance to St. Andrews Bay, near Panama City, 2 July 1965 (by D. Flescher); at 3 miles SE of Dog Island, 16 May 1963. This species occurs on whip corals (gorgonians), particularly on the denuded stems where the barnacles may become encrusted by regenerative growth of the gorgonians' outer soft layer (coenenchyme). As the barnacle develops, changes in its growth form tend to elevate the barnacle's aperture above the encrustation that may be encroaching upon its basal attachment.

6. *Balanus improvisus* Darwin

From rock jetties at the entrance to St. Andrews Bay, near Panama City, 6 November 1964; and from pilings at St. Teresa, 25 May 1965, by W. Stewart. This very abundant species occurs on many substrates in this area, particularly on pilings and oyster shells.

7. *Balanus trigonus* Darwin

From the compartments of another barnacle (*Chelonibia caretta*) on the carapace of a loggerhead turtle (*Caretta caretta*) off Alligator Harbor, 22 April 1964. Pilsbry (1916) recorded this species from sponges; on the third cirri it possesses special spines that can break sponge tissue from its aperture. Henry (1954) recorded a single occurrence from the Gulf of Mexico without any more detailed locality data, but with a notation that it was associated with deep water crabs or palinurids. As a result of recent discoveries of this species in the Miami area (Moore and McPherson, 1963) and on the North Carolina coast (Wells et al., 1964; Ross et al., 1964), it has been suggested that it may be extending its geographic range. Transport on sea turtles could contribute materially to its passive dispersal to new areas. However,

its additional occurrence off Georgia and on the northeast and west coasts of Florida (personal collections) suggests that it is more widely distributed along the coast of the southeastern United States than published records indicate.

8. *Balanus venustus niveus* Darwin

From rock jetties at the entrance to St. Andrews Bay, near Panama City, 6 November 1964; from dead shells, St. Teresa, 26 September 1964; and from shells of the calico scallop (*Aequipecten gibbus*) from off Cape St. George, 2 October 1962. This subspecies is abundant and occurs on a wide variety of hard substrates. It has been recorded previously from the Atlantic and Gulf coasts as *B. amphitrite niveus* (Pilsbry, 1916, Henry, 1959), but Harding's nomenclature, based on the Darwin types (Harding, 1962), is followed here. The colored form described from Sarasota Bay by Pilsbry (1916, p. 94) is common offshore.

9. *Balanus venustus obscurus* Darwin

From loggerhead turtles (*Caretta caretta*) collected near St. Teresa, 22 April 1964, and near Bald Point, Franklin Co., 2 May 1965. This subspecies has not been reported previously from the Gulf of Mexico, nor from mainland North American waters, but it is known from Jamaica (Harding, 1962).

10. *Acasta cyathus* Darwin

From a sponge (*Ircinia fasciculata*) from Lighthouse Point, Franklin Co., 10 March 1962. This species is a common inhabitant of certain sponges in the northeastern Gulf: tube sponges (*Callyspongia vaginalis*), stinker sponges (*Ircinia fasciculata*), vase sponges (*Ircinia campana*), and sponges of the genus *Verongia*. In each case, the barnacle is anchored within the sponge tissue by recurved spines on the compartmental plates. It possesses stout spines on the fourth cirri which serve to prevent occlusion of the barnacle aperture by lateral growth of the host sponge. The genus *Acasta* is characterized by these morphological adaptations associated with life in sponges (Pilsbry, 1916). Although Henry (1954) recorded this species only from the southern part of the Gulf, it is contained in the checklist of the Florida State University Marine Laboratory.

11. *Pyrgoma floridanum* Pilsbry

From coral (*Siderastrea radians*) from St. Teresa, Franklin Co., at 2-10 feet depth, 4 November 1961, 10 February 1962, 16 May 1964. This species commonly occurs on and imbedded within the coral mass, usually marked by swollen, gall-like knobs on the corallum. One coral colony 11 cm in diameter bore 8 living specimens at its surface, and the empty plates of several other specimens completely imbedded in the interior of the corallum. Pilsbry (1931) described this species from specimens associated with another coral (*Manicina areolata*) from off Tarpon Springs, approximately 160 miles SE of St. Teresa. Members of this genus are typically associated with corals (Pilsbry, 1916).

Subfamily CHELONIBIINAE

12. *Chelonibia caretta* (Spengler)

From the carapace of a loggerhead turtle (*Caretta caretta*) at St. Teresa, Franklin Co., 22 April 1964. This species has not been reported from the Gulf of Mexico, but has been reported previously from New Jersey and the West Indies (Pilsbry, 1916).

13. *Chelonibia manati lobatibasis* Pilsbry

From a loggerhead turtle (*Caretta caretta*) from near Bald Point, Franklin Co., 2 May 1965. The specimen was partially imbedded, the basal lobes of the parietes penetrating 3-4 mm into the skin of the turtle. Pilsbry (1916) described this subspecies from a loggerhead turtle collected at Osprey, Florida, approximately 50 miles S of Tampa. It apparently has been known only from his original discovery.

14. *Chelonibia patula* (Ranzani)

From a blue crab (*Callinectes sapidus*) collected in Alligator Harbor, 11 October 1964. This species is typically associated with arthropods; in this area it is common on the carapace of older, mature blue crabs and on "horseshoe crabs" (*Limulus polyphemus*).

15. *Chelonibia testudinaria* (Linné)

From loggerhead turtles (*Caretta caretta*) at St. Teresa, 22 April 1964, and near Bald Point, Franklin Co., 2 May 1965. This species

is characteristically found on the carapace of the loggerhead turtle; it frequently supports a secondary layer of encrusting organisms. Although it has been recorded from several locations in the Gulf (Pilsbry, 1916), the nearest recorded locality for this species has been Pensacola, 100 miles W of Panama City.

16. *Platylepas hexastylus* (Fabricius)

From a loggerhead turtle (*Caretta caretta*) near Bald Point, 2 May 1965. These barnacles were depressed and partially imbedded in the skin, producing a convex basal surface. Structurally, this species is well adapted to life on sea turtles; each compartmental plate is reinforced by a calcareous strut. Pilsbry (1916) has recorded this species from a loggerhead turtle from Osprey, approximately 50 miles S of Tampa. He also described a variety (or subspecies), *Platylepas hexastylus ichthyophila*, from a garfish caught in brackish water in Hernando County, approximately 40 miles N of Tampa.

17. *Platylepas hexastylus* variety

From a loggerhead turtle near Bald Point, Franklin Co., 2 May 1965. More than twenty specimens similar to the form described and illustrated by Pilsbry (1916: p. 287; Pl. 67, fig. 4) as a variety from Sicily. This variety is not depressed but has a cylindrical form, with lobate bases of the parietes projecting downward into the turtle's skin.

18. *Stomatolepas praegustator* Pilsbry

From a loggerhead turtle (*Caretta caretta*) near Bald Point, Franklin Co., 2 May 1965. Forty specimens were found in the mouth cavity and upper gullet, where they were partially imbedded. An additional group of 55 specimens were removed from the soft dermis of the dorsal aspect of the hind legs, where they were also partially imbedded. Pilsbry (1910) described this species from the gullet of a loggerhead turtle from the Tortugas. A second collection, made by W. L. Schmitt from the tongue of a loggerhead turtle at the same locality, is contained in the U. S. National Museum (USNM No. 79178). The present account is apparently but the third record of this species, and the first report of its occur-

rence on the outside of a turtle's body. The beautifully sculptured compartmental plates provide anchorage in the host's tissue.

Family CHTHAMALIDAE

19. *Chthamalus fragilis* (Darwin)

From rock jetties at the entrance to St. Andrews Bay, near Panama City, Bay Co., 12 October 1963 and 6 November 1964; and from Alligator Harbor, 22 April 1964. This species is widely distributed in the northeastern Gulf where it is common on suitable substrates in the intertidal zone, on wood, stone, metal, and frequently on salt marsh grass (*Spartina patens*). It usually occurs higher in the intertidal zone than any other macroscopic sessile marine invertebrate.

20. *Chthamalus stellatus bisinuatus* Pilsbry

From rock jetties at the entrance to St. Andrews Bay, near Panama City, 12 October 1963, 30 April 1964, and 8 May 1965, by W. Stewart. Numerous specimens were widely distributed in the intertidal zone interspersed among specimens of *Chthamalus fragilis*, which outnumber them. This subspecies has been reported previously from Brazil (Pilsbry, 1916; Oliveira, 1941) and West Africa (Stubbings, 1961).

Suborder Lepadomorpha

Family LEPADIDAE

21. *Lepas anatifera* Linné

From shells of purple sea snails (*Janthina* species) collected at St. Andrews State Park, near Panama City, Bay Co., 28 April 1963, and from driftwood near Panama City, 11 April 1965, by H. Matthews. This species is characteristically attached to driftwood and other floating substrates.

22. *Lepas pectinata* Spengler

From floating Gulfweed (*Sargassum* species) and shells of purple sea snails (*Janthina* species) washed ashore at St. Andrews

State Park, near Panama City, 28 April 1963. This species is also characteristically associated with floating substrates.

Family TRILASMATIDAE

23. *Octolasmis hoeki* (Stebbing)

Reported as a commensal in the branchial chamber of an oxystomatous crab (*Calappa flammea*) from a nearshore area near Panama City (Hulings, 1961).

24. *Octolasmis lowei* (Darwin)

From the branchial chambers of blue crabs (*Callinectes sapidus*) collected at Alligator Harbor, 10 July 1965, by T. Borkowski; and the branchial chamber of a stone crab (*Menippe mercenaria*) at St. Teresa, 30 August 1965. This common species is a commensal in the branchial chambers of crabs, particularly in older, mature blue crabs. It has been reported previously from the Alligator Harbor area by Pearse (1952) as *O. mulleri*, which is recognized today as a synonym of *O. lowei* (Causey, 1961).

Family ALEPADIDAE

25. *Conchoderma virgatum* (Spengler)

From the dorsal fin on an orange filefish (*Alutera schoepfi*) collected 31 December 1964, by H. Matthews; and from the head of a cowfish (*Lactophrys tricornis*) collected 9 April 1966, by T. Scanland, both at the entrance to St. Andrews Bay, near Panama City. Although not recorded from the Gulf of Mexico, this species has been reported elsewhere from seaweeds, sea turtles, and large fish, as well as from the bottoms of ships (Pilsbry, 1907).

Family SCALPELLIDAE

26. *Scalpellum arietinum* Pilsbry

From the calico scallop (*Aequipecten gibbus*) beds off Cape St. George, 2 October 1962; and from materials dredged 15 miles S of Alligator Point, 14 November 1965. This species has been reported from a nearshore area near Panama City (Hulings, 1961).

Order RHIZOCEPHALA

Family SACCULINIDAE

27. *Sacculina pustulata* Boschma

Reported as a parasite on a spider crab (*Hemus cristulipes*) collected 10 miles SE of Alligator Point (Reinhard, 1955).

28. *Loxocephalus texanus* Boschma

From blue crabs (*Callinectes sapidus*) collected in Alligator Harbor, 11 October 1964. This species is not uncommon as a parasite of blue crabs in this area.

29. *Loxothylacus panopaei* (Gissler)

From a hairy crab (*Pilumnus sayi*) from 15 miles S of Alligator Harbor, at 60 feet depth, 14 November 1965 (by T. Scanland); and from mud crabs (*Neopanope packardii*) from St. Andrews Bay, near Panama City, 20 September 1957 (Oceanographic Institute collection). This species is a parasite of mud crabs (Xanthidae), and has been reported in the Gulf from Tampa and from Englewood, approximately 75 miles S of Tampa, and in Louisiana and Texas (Reinhard and Reischman, 1958).

30. *Peltogaster* species

From hermit crabs (*Pagurus longicarpus*) from Live Oak Island, Wakulla Co., 3 November 1962 and 21 November 1963. To my knowledge, this sacculinid parasite of hermit crabs has not been reported previously from the Gulf of Mexico.

Order ACROTHORACICA

Family KOCHLORINIDAE

31. *Kochlorine floridana* Wells and Tomlinson

From shells of the mossy ark (*Arca imbricata* = *A. umbonata*), the turkey wing ark (*Arca zebra*), and a variety of other molluscs, and from calcareous bryozoans, coral, barnacle compartments (*Balanus calidus*), tubes of serpulid polychaetes, and calcareous red algae; 3-5 miles SE of Dog Island, 30-35 feet depth, 29 September 1962, 29 October 1962, 23 November 1962, 16 May 1963 (Wells and

Tomlinson, 1966), and 19 June 1965. Also from shells of the calico scallop (*Aequipecten gibbus*) from off Cape St. George, 60 feet depth, 4 October 1962; and from shells of the giant eastern murex (*Murex fulvescens*) from rock jetties at the entrance to St. Andrews Bay, near Panama City, 5 November 1965, by G. Bertrand.

GEOGRAPHIC CONSIDERATIONS

Of the 31 taxa included in this report, a high percentage are newly recorded from the northeastern Gulf of Mexico. Six taxa have not been recorded previously from the Gulf: *Balanus venustus obscurus*, *Chelonibia caretta*, *Platylepas hexastylus* variety, *Chthamalus stellatus bisinuatus*, *Conchoderma virgatum*, and *Pelto-gaster* species. Present records of the following species extend their known distribution 400 miles northward into the shallow waters of western Florida: *Balanus declivus*, *Acasta cyathus*, and *Stomatolepas praegustator*. Records of four species extend their known geographic range at least 200 miles northward along the Florida west coast; and additional records represent new localities for species that have been collected at other localities around the Gulf of Mexico. These new records are not to be taken as evidence of recent movement of many barnacle species into the study area. Instead, they reflect an increasing interest in the local fauna by marine biologists. It is to be expected that further research on this group will extend the known distribution of several of these barnacle species even further.

This barnacle fauna includes a number of widespread, warm-temperature species that are also distributed along the Atlantic coast of the United States as far north as New Jersey or Massachusetts: *Balanus venustus niveus*, *B. eburneus*, *B. improvisus*, *Chelonibia patula*, and *Chthamalus fragilis*. The barnacles most often found in estuaries and inshore areas of brackish water are these warm-temperate species. Most exhibit a continuous distribution around the tip of peninsular Florida through waters of distinctly tropical characteristics (Moore and Frue, 1959; Stephenson and Stephenson, 1950). For an analysis of geographic affinities, *Conchoderma virgatum* and the *Lepas* species, which are nearly cosmopolitan, should be added to these widespread species.

Species of tropical or subtropical distribution which do not extend north of Cape Canaveral or Cape Hatteras on the east coast far outnumber the widespread species. They include *Balanus*

amphitrite amphitrite, *B. calidus*, *B. declivus*, *B. galeatus*, *B. trigonus*, *B. venustus obscurus*, *Acasta cyathus*, *Chthamalus stellatus bisinuatus*, *Octolasmis* species, *Scalpellum arietinum*, *Saculina pustulata*, *Loxothylacus manopaei*, and *Kochlorine floridana*. The species associated with sea turtles (*Platylepas*, *Stomatolepas*, and *Cheilonibia* species) should be included here, for they are usually considered to be tropical although subject to being transported by their hosts to extratropical shores. This sizeable group of species is an indication of the importance of the tropical element in the fauna of the northeastern Gulf. These barnacles generally are found in offshore or higher salinity waters in this area.

The case of *Chthamalus stellatus bisinuatus* warrants special comment, for this tropical form has been discovered in numbers near Panama City, but to our knowledge has not been recorded previously from the Gulf of Mexico. Although another subspecies, *C. s. angustitergum*, has been reported from the Florida Keys (Pilsbry, 1916; Stephenson and Stephenson, 1950), *C. s. bisinuatus* has been recorded previously only from Brazil (Pilsbry, 1916; Oliveira, 1941) and West Africa (Stubbings, 1961). However, *C. s. bisinuatus* evidently has a wide distribution in the eastern Gulf of Mexico, for it also occurs in suitable habitats on the southern west coast of Florida (personal collections). The absence of previous records from this region probably is due to the inconspicuous appearance of this species and its apparent preference for intertidally situated hard substrates. Henry (1954) notes that members of the genus *Chthamalus* are often overlooked by collectors because of their small size and inconspicuous form. Alternatively, modern man has created many suitable habitats for this species by his construction of jetties, bridge pilings, and navigational aids, and this species may enjoy a wider distribution as a consequence. Its presence in the Panama City area might have resulted originally from its transport on the hulls of ships that use this port.

In summary, the barnacle fauna of the northeastern Gulf consists of a mixture of warm temperate and tropical species.

SUBSTRATE

Of the barnacles recorded from the northeastern Gulf, a majority (17) exhibit relatively specific symbiotic associations with particular substrates or hosts. One large group attaches to the exposed surfaces of sea turtles, particularly to the carapace, but

also to the skin of the head, neck, legs, and ventral surfaces: *Chelonibia caretta*, *C. manati lobatibasis*, *C. testudinaria*, *Platy-lepas hexastylus*, *P. hexastylus* variety, and *Stomatolepas praegustator* (which also attaches in the posterior part of the turtle's mouth cavity). Heavy accumulations of *Chelonibia* species may occur on the turtle's carapace, especially near the posterolateral margins, providing suitable surfaces for attachment by a secondary layer of fouling organisms. Such secondary encrustations may include barnacles of less specific substrate requirements, hydroids, anemones, bryozoans, serpulid polychaetes, molluscs, and algae. Sabellid and spionid annelids and molluscs which burrow into the calcareous plates of the *Chelonibia* contribute further to the fauna of the sea turtle shell.

Another large group exhibiting specific substrate requirements is comprised of the barnacles associated with crabs: *Chelonibia patula*, which typically attaches to the carapace; *Octolasmis hoeki* and *O. lowei*, which attach to crabs' gills; and the parasitic species *Sacculina pustulata*, *Loxocephalus texanus*, *Loxothylacus panopaei*, and *Peltogaster* species, which invade the inner tissues of their hosts and extend to the outside as sacs attached to the abdomens of their hosts. Other barnacles are characteristically imbedded in sponges (*Balanus declivus* and *Acasta cyathus*) or in coelenterates (*Balanus galeatus* and *Pyrgoma floridanum*).

Another species that exhibits a relatively specific affinity for a special substrate is *Kochlorine floridana*, which perforates only calcareous materials.

The remaining 13 species, including the barnacles most likely to be seen by biologists or laymen, are relatively non-specific in their choice of substrate and have been recorded from a wide variety of objects. Generally, these species attach to non-living structures, but they may also occur wherever living organisms present a suitable firm substrate. Thus, the shells of arthropods and molluscs may provide attachment for such barnacles, whether the arthropod or mollusc is alive or not. *Balanus amphitrite amphitrite*, *B. calidus*, *B. eburneus*, *B. improvisus*, *B. trigonus*, *B. venustus niveus*, *B. c. obscurus*, *Chthamalus fragilis*, *C. stellatus bisinuatus*, and *Scalpellum arietinum* are species of the northeastern Gulf that exhibit such non-specificity. Additional examples of barnacles of non-specific habits would include *Lepas anatifera*, *L. pectinata*, and *Conchoderma virgatum* which however, are pri-

marily associated with floating objects, whether living or inanimate.

SUMMARY

Thirty-one taxa of barnacles are recorded from inshore waters of the northeastern Gulf of Mexico, including 16 which are newly reported from this area. Six taxa are newly recorded for the Gulf of Mexico, including *Balanus venustus obscurus*, *Chthamalus stellularis bisinuatus*, *Chelonibia caretta*, *Platylepas hexastylus* variety, *Conchoderma virgatum*, and *Peltogaster* species. This barnacle fauna consists of a mixture of warm-temperate and tropical species. Many species exhibiting specific symbiotic relationships with sea turtles, with crabs, and with other marine organisms are represented.

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to the students who have contributed specimens of interesting species, and to Mary Jane Wells who has ably assisted in the collection and identification of the materials included in this report. This study has been supported by National Science Foundation grant GB-819 to Florida State University.

LITERATURE CITED

- CAUSEY, D. 1961. The barnacle genus *Octolasmis* in the Gulf of Mexico. *Turtlex News*, vol. 39, pp. 51-55.
- HARDING, J. P. 1962. Darwin's type specimens of varieties of *Balanus amphitrite*. *Bull. Brit. Mus. (Nat. Hist.) Zool.*, vol. 9, no. 7, pp. 273-296, 10 pls.
- HENRY, DORA P. 1954. Cirripedia; the barnacles of the Gulf of Mexico. *In: Gulf of Mexico: Its origin, waters, and marine life.* U. S. Fish and Wildl. Serv., Fishery Bull. 89, vol. 55, pp. 443-446.
- . 1959. The distribution of the *amphitrite* series of *Balanus* in North American waters. *In: Marine boring and fouling organisms.* Univ. Washington, Friday Harbor Symposium, pp. 190-203.
- HULINGS, N. C. 1961. The barnacle and decapod fauna from the nearshore area of Panama City, Florida. *Quart. Jour. Florida Acad. Sci.*, vol. 24, pp. 215-222.
- MOORE, H. B., AND A. C. FRUE. 1959. The settlement and growth of *Balanus improvisus*, *B. eburneus*, and *B. amphitrite* in the Miami area. *Bull. Mar. Sci. Gulf & Carib.*, vol. 9, pp. 421-440.
- MOORE, H. B., AND B. F. MCPHERSON. 1963. Colonization of the Miami area by the barnacle *Balanus trigonus* Darwin, and a note on its occurrence

- on the test of an echinoid. *Bull. Mar. Sci. Gulf & Carib.*, vol. 13, pp. 418-421.
- OLIVEIRA, L. P. H. DE. 1941. Contribuição ao conhecimento dos crustaceos do Rio de Janeiro sub-ordem "Balanomorpha" (Cirripedia: Thoracica). *Mem. Inst. Oswaldo Cruz*, vol. 36, pp. 1-36.
- PEARSE, A. S. 1952. Parasitic crustaceans from Alligator Harbor, Florida. *Quart. Jour. Florida Acad. Sci.*, vol. 15, pp. 187-243.
- PILSBRY, H. A. 1907. The barnacles (Cirripedia) contained in the collections of the U. S. National Museum. *Bull. U. S. Nat. Mus.*, vol. 60, pp. 1-122, 11 pls.
- . 1910. *Stomatolepas*, a barnacle commensal in the throat of the loggerhead turtle. *Amer. Nat.*, vol. 44, pp. 304-306.
- . 1916. The sessile barnacles (Cirripedia) contained in the collections of the U. S. National Museum, including a monograph of the American species. *Bull. U. S. Nat. Mus.*, vol. 93, pp. 1-366, 76 pls.
- . 1931. The cirriped genus *Pyrgoma* in American waters. *Proc. Acad. Nat. Sci., Philadelphia*, vol. 83, pp. 81-83.
- REINHARD, E. G. 1955. Some Rhizocephala found on brachyuran crabs in the West Indian region. *Jour. Wash. Acad. Sci.*, vol. 45, pp. 75-80.
- REINHARD, E. G., AND P. G. REISCHMAN. 1958. Variation in *Loxothylacus panopaei* (Gissler), a common sacculinid parasite of mud crabs, with the description of *Loxothylacus perarmatus*, n. sp. *Jour. Parasitol.*, vol. 44, pp. 93-97.
- ROSS, A., M. J. CERAME-VIVAS, AND L. R. McCLOSKEY. 1964. New barnacle records for the North Carolina coast. *Crustaceana*, vol. 7, pp. 312-313.
- STEPHENSON, T. A., AND ANNE STEPHENSON. 1950. Life between tide marks in North America. I. The Florida Keys. *Jour. Ecol.*, vol. 38, pp. 345-402, pls. 9-15.
- STUBBINGS, H. G. 1961. Cirripedia Thoracica from tropical West Africa. *Atlantide Report*, Copenhagen, No. 6, pp. 7-41.
- WELLS, H. W., AND J. T. TOMLINSON. 1966. A new burrowing barnacle from the Western Atlantic. *Quart. Jour. Florida Acad. Sci.*, vol. 29, pp. 27-37, figs. 1-3.
- WELLS, H. W., MARY JANE WELLS, AND I. E. GRAY. 1964. The calico scallop community in North Carolina. *Bull. Mar. Sci. Gulf & Carib.*, vol. 14, pp. 561-593.

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